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Interactive comment on "Consolidating the Randolph Glacier Inventory and the Glacier Inventory of China over the Qinghai-Tibetan Plateau and Investigating Glacier Changes Since the mid-20th Century" *by* Xiaowan Liu et al.

Anonymous Referee #1

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This study is presenting a new method to derive glacier volumes and compares several approximations to obtain glacier volumes after application to two different datasets. Resulting volumes are presented at the mountain range level rather than for individual glaciers. Although I think it makes much sense to determine glacier volume changes from two glacier inventories, I have a couple of major issues with this study that I are shortly describe in the following:

(1) The English is not good enough and requires revision by a native speaker. Due to this, it was very stressful for me to read the text and sometimes I have to guess what

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Discussion paper

the authors could have meant.

(2) As far as I can see, the study introduces a new method of glacier volume calculation (Section 4.1). I think this requires proper introduction (showing results and uncertainties for individual glaciers) in a more topical journal (e.g. The Cryosphere) before it can be applied widely and used for datasets in ESSD. I do also not fully understand how this method is working, as the text describing the method is very short and equations are poorly illustrated (e.g. where in Fig. 2 can I find the variables used in Eqs. (3) and (4) and why is a grid of 1 km used when the SRTM DEM has 30 m resolution?).

(3) Glacier areas in RGI4.0 are highly flawed in this region and are generally too large (e.g. due to missing rock outcrops). They should thus better not be used with methods that are based on an up-scaling of area alone or any change assessment (neither area nor volume). The glacier volume changes calculated here (Table 4) are thus also much too high and basically reflect differences in interpretation rather than real glacier changes.

(4) Also the results for disappeared, fragmented and surged glaciers (Figs. 5 to 7) are strongly impacted by the flaws in the digitization of RGI4.0 and present largely arbitrary results. In my opinion the RGI4.0 dataset is of insufficient quality for such calculations.

(5) It is unclear to me why so many different methods of volume calculation have been applied and which of these are used for which dataset. For example, the authors name it 'Calculated', 'Equation-based' or 'DGA-derived' in Table 2 and Calculated, Equation 1 and Equation 2 in Table 4. Where are they described, which method is used for what purpose?

(6) The authors describe a long list of uncertainties in Section 6, but miss to mention that RGI4.0 has such a bad quality in the study region. I see nowhere in the study a figure showing a glacier outline overlays from both inventories to illustrate the problem.

(7) In effect, it seems the authors present differences between the two inventories

as real changes in glacier number, area and volume and are unaware that these are largely governed by the poor RGI4.0 quality. Its poor geo-location or missing rock outcrops are not even mentioned.

As a remark to L11, I think the QTP is only a part of the 'Third Pole'. The Third Pole also includes regions outside of QTP (e.g. western Pamir/Karakoram and Hindu-Kush). As a short note, I think the scale of the map in Fig. 4 is inappropriate to visualize the differences. Where is the class 'mountains' and where are unfilled boundaries (as in the legend)? Please also note that the two datasets in the Supplement have a different projection and file/attribute names contain characters that cannot be displayed.

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